10-20-00

A

JC759 U.S. PTO
10/18/00

Please type a plus sign (+) inside this box → +

PTO/SB/05 (09-00)
Approved for use through 10/31/2002. OMB 0651-0032
Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	004688.P003
First Inventor or Application Identifier	Yakov Kamen
Title	METHOD AND SYSTEM FOR OPTIMAL USAGE OF MEMORY FOR STORING
Express Mail Label No.	EL635877877US

jc893 U.S. PTO 09/691794 10/18/00

APPLICATION ELEMENTS
See MPEP chapter 600 concerning utility patent application contents

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

1. [X] Fee Transmittal Form (e.g. PTO/SB/17) (Submit an original, and a duplicate for fee processing)
2. [X] Applicant claims small entity status. See 37 CFR 1.27.
3. [X] Specification — Total Pages 18
   (preferred arrangement set forth below)
   - Descriptive title of the Invention
   - Cross References to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to sequence listing, a table, or a computer program listing appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings (if filed)
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
4. [X] Drawing(s) (35 U.S.C.113) — Total Sheets 1
5. Oath or Declaration — Total Pages
   a. [ ] Newly executed (original copy)
   b. [ ] Copy from a prior application (37 CFR 1.63(d)) (for continuation/divisional with Box 16 completed)
      i. [ ] DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. [ ] Application Data Sheet. See 37 CFR 1.76.
7. [ ] CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix)
8. Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary)
   a. [ ] Computer Readable Form (CFR)
   b. [ ] Specification Sequence Listing on:
      i. [ ] CD-ROM or CD-R (2 copies); or
      ii. [ ] Paper
   c. [ ] Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

9. [ ] Assignment Papers (cover sheet & document(s))
10. [ ] 37 CFR 3.73(b) Statement (when there is an assignee) [ ] Power of Attorney
11. [ ] English Translation Document (if applicable)
12. [ ] Information Disclosure Statement (IDS)/PTO - 1449 [ ] Copies of IDS Citations
13. [ ] Preliminary Amendment
14. [X] Return Receipt Postcard (MPEP 503) (Should be specifically itemized)
15. [ ] Certified Copy of Priority Document(s) (if foreign priority is claimed)
16. [ ] Other: ....

17. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment:
[ ] Continuation [ ] Divisional [ ] Continuation-in-part (CIP) of prior application No: ____/________
Prior application Information: Examiner____________ Group/Art Unit: ________
For CONTINUATION or DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

17. CORRESPONDENCE ADDRESS

[ ] Customer Number of Bar Code Label (Insert Customer No. or Attach bare code label here) or [X] Correspondence address below

Name	BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP				
Address	12400 Wilshire Boulevard, Seventh Floor				
City	Los Angeles	State	California	Zip Code	90025
Country	U.S.A.	Telephone	(310) 207-3800	Fax	(310) 820-5988

Name (Print/Type)	Eric S. Hyman, Reg. No. 30,139		
Signature	[signature]	Date	10/18/00

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231.

PTO/SB/17 (09-00)
Approved for use through 10/31/2002. OMB 0651-0032
Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

FEE TRANSMITTAL for FY 2001

Patent fees are subject to annual revision.

TOTAL AMOUNT OF PAYMENT ($) 345.00

Complete if Known	
Application Number	
Filing Date	10/18/00
First Named Inventor	Yakov Kamen, et al.
Examiner Name	
Group Art Unit	
Attorney Docket Number	004688.P003

METHOD OF PAYMENT (check one)

1. ☒ The Commissioner is hereby authorized to charge indicated fees and credit any over payments to:

Deposit Account Number: 02-2666

Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

☒ Charge Any Additional Fee Required Under 37CFR 1.16 and 1.17

☒ Applicant claims small entity status. See 37 CFR 1.27

2. ☒ Payment Enclosed:

☒ Check ☐ Money Order ☐ Other

FEE CALCULATION

1. FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
101	690	201	345	Utility filing fee	$345
106	310	206	155	Design filing fee	
107	480	207	240	Plant filing fee	
108	690	208	345	Reissue filing fee	
114	150	214	75	Provisional filing fee	

SUBTOTAL (1) ($) 345.00

2. EXTRA CLAIM FEES

			Extra Claims		Fee from below		Fee Paid
Total Claims	15	-20** =	0	X	$9.00	=	0.00
Independent Claims	2	-3** =	0	X	$40.00	=	0.00
Multiple Dependent						=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
103	18	203	9	Claims in excess of 20
102	78	202	39	Independent claims in excess of 3
104	270	204	135	Multiple Dependent claim
109	78	209	39	**Reissue independent claims over original patent
110	18	210	9	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 0.00

*or number of previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet.	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for *ex parte* reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for response within first month	
116	380	216	190	Extension for response within second month	
117	870	217	435	Extension for response within third month	
118	1,360	218	680	Extension for response within fourth month	
128	1,850	228	925	Extension for response within fifth month	
119	300	219	150	Notice of Appeal	
120	300	220	150	Filing a brief in support of an appeal	
121	260	221	130	Request for oral hearing	
138	1,360	138	1,360	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidably	
141	1,210	241	605	Petition to revive - unintentionally	
142	1,210	242	605	Utility issue fee (or reissue)	
143	430	243	215	Design issue fee	
144	580	244	290	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Petitions related to provisional applications	
126	240	126	240	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	
146	760	246	380	Filing a submission after final rejection (37 CFR 1.129(a))	
149	760	249	380	For each additional invention to be examined (37 CFR 1.129(b))	
179	710	279	355	Request for Continued Examination (RCE)	
169	900	169	900	Request for expedited examination of a design application	

Other fee (specify) ________________

* Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($)

SUBMITTED BY				Complete (if applicable)	
Typed or Printed Name	Eric S. Hyman, Reg. No. ~~30~~,139			Reg. Number	
Signature	[signature]	Date	10/18/00	Deposit Account User ID	02-2666

Docket No.: 004688.P003
Express Mail No.: EL635877877US

UNITED STATES PATENT APPLICATION

FOR

METHOD AND SYSTEM FOR OPTIMAL USAGE OF MEMORY FOR STORING SCHEDULING AND GUIDING DATA IN 3D-ENABLED EPG

Inventors:

Yakov Kamen
Leon Alexander Shirman

Prepared by:
BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP
12400 Wilshire Boulevard, Seventh Floor
Los Angeles, California 90025
(310) 207-3800

BACKGROUND OF THE INVENTION

This application claims the benefit of United States Provisional Application No. 60/190,327, filed on March 16, 2000, entitled METHOD AND SYSTEM FOR OPTIMAL USEAGE OF MEMORY FOR STORING SCHEDULING AND GUIDING DATA IN 3D-ENABLED EPG.

1. **Field of the Invention**

The invention relates to television electronic programming guides ("EPGs"). More particularly, it relates to a method and apparatus for cost-effective memory management.

2. **Description of the Related Art**

Prior art EPGs provide television viewers with on-screen television schedule information presented, e.g., in a convenient, regular or non-regular rectangular grid format. One type of EPG is used in conjunction with an analog television system. That type of EPG sometimes is called a passive programming guide ("PPG"). In such a system, one of the cable channels is reserved for displaying programming information. The programming information is displayed in a grid pattern. The first column lists the various channels of the cable broadcast system. Additional columns, e.g., columns two, three and four, display program information for what is showing on the channels listed in the first column, in half-hour increments. For example, suppose that a person tunes to an EPG at 10:35 p.m., the second column would display program information for 10:00 - 10:30 p.m., the third column would display program information for 10:30 - 11:00 p.m., and the fourth column would display program information for

11:00 p.m. - 11:30 p.m. A row at mid-screen displays the time slots relating to the second, third and fourth columns. A portion of the television ("TV") screen typically provides continuous advertisements.

Cable TV systems typically provide more television channels than there is space for rows in a useable grid pattern. A grid is typically used that scrolls at a pre-selected slow rate, so that a viewer can see what is showing on all of the channels. In the case of satellite broadcasts, the situation becomes even more complex. Digital satellite TV systems may provide 1,000 TV channels with various TV programs and services.

The program schedule information contained in an analog EPG is typically broadcast by an operator on a dedicated one of the channels of the cable TV system. However, most digital EPGs operate in a different way. In a digital EPG, program schedule information and sometimes applications and/or systems software is transmitted to equipment located on the viewer's premises (e.g., a digital set-top box) by way of broadcast, cable, direct satellite or other suitable form of transmission. A digital set-top box ("STB") serves to deliver compressed digital video, data and audio signals in real time usable form to one or more TV sets. The STB, which is basically a dedicated computing device, contains memory allowing the program schedule information to be stored for later viewing. The program schedule information stored in the STB is periodically updated, e.g., on a continuous, daily, weekly, or biweekly basis or any other useful pattern. A microprocessor within the STB utilizes the viewer's TV set to display the stored

program schedule information and to implement other functions of the EPG in response to user-generated signals. The functions available to the viewer vary depending on the sophistication of the particular EPG and hardware capabilities.

Digital EPGs are often used in an interactive television system and are sometimes called interactive programming guides ("IPGs"). In an interactive television system EPG, a user may browse schedule information in any order, select programs from on-screen menus for current or future viewing, and order pay-per-view programming on demand. Some (advanced) EPGs permit other functions, e.g., an e-mail function, or a function that permits a user to block certain kinds of programs, such as adult or violent programs, and choose favorite channels. Prior art digital EPGs, however, collectively fail to provide viewing capabilities that realistically address the viewing habits of the users of these systems.

As mentioned above, an analog TV EPG is viewed on a TV screen as a continuously scrolling rectangular table. This solution does not allow any user interaction and is suitable only for the passive television viewer. This is a poor solution for interactive TV, because:

1. The scrolling speed is set upfront (it is not necessarily constant) and cannot be adjusted by user's request.
2. In an analog EPG system, the user cannot switch to the channel of choice immediately from the EPG (e.g., by clicking on a display of a channel number on the EPG). Instead, the user must input the channel number with a remote controller.

3. The analog EPG scrolling table is completely sequential (providing information in an order depending upon channel number and designer's chosen style) and the user cannot pre-sort schedule data or otherwise personalize the EPG.

A more sophisticated solution is the interactive EPG or ("IPG"). Unfortunately existing solutions have their own problems. For example, interactive EPG systems provide drop-down menus that require multiple steps in order to interact with the EPG, which can lead to user frustration when a search for a desired program is unsuccessful or simply too complicated. As known today, interactive EPGs are inflexible in terms of menu design, because the menu itself is a set of regular two-dimensional grids.

Additional problems with the prior art electronic programming guides are listed below.

1. <u>Program Description Truncation</u>. When displaying schedule information in grid format, i.e., columns representing time slots and rows representing channels, program titles are generally truncated to fit into the cells of the grid. The width of a grid cell varies with the program duration. Since a 30-minute program is allotted only a small space for the program title and description, titles and/or descriptions for half- and even full-hour programs often must be truncated to fit in the allotted space. Some systems simply cut off the description of a program without abbreviating it in any way, such that the user cannot determine the subject matter of the

program. While some systems partially alleviate this problem by providing two lines of text in each grid cell, this is a less than ideal solution because program descriptions may still be truncated.

2. Inability to Create a Program Itinerary While Viewing a TV Program. Prior art EPGs lack a method for a user to create a program itinerary, electronically, concurrently while the user views a program on the TV screen. Thus, when a user views a program on a particular channel, he or she cannot electronically set up a sequence of other channels to surf.

3. Inability to Simultaneously Channel Surf and View EPG. Prior EPGs leave much guess work for the user as he or she navigates through a sequence of channels. When skimming through channels and trying to determine what program is being displayed on a channel, commonly known as "channel surfing," the user must guess which program is currently being aired from the video segment encountered during channel surfing. Since up to thirty percent of the programming appearing on a channel at any given time is advertising, the user is not provided with any clues as to what program is showing on a selected channel at a given time. Hence, the user often has no choice but to wait until an advertisement or commercial ends before learning what program is showing on the selected channel. Existing solutions allow user to go to the channel and find more information by using a special button of remote control, i.e., "info" button. Thus, a need exists for an EPG that displays current program schedule

information for each channel at the same time that the user surfs through the channels.

4. Text Size. Unfortunately, existing EPGs allow for only one font size. However, human beings do not all have the same acuity of vision. As a result, two problems appear: some viewers may have difficulty or even be unable to read the information in the EPG and some viewers want to see more information using smaller font.

5. Specular Highlighting. Existing EPGs provide only a very rudimentary lighting capability. For example, existing EPGs do not have an adequate means to adjust the brightness of the EPG. This detracts from the utility of the EPG.

Thus, methods and apparatus for generating a two-dimensional ("2D") TV graphical user interface ("GUI") for providing TV program guides on a TV screen are known in the art. A conventional TV GUI uses a single layer of on-screen display graphics to present TV program information and, typically, multiple menus are provided to enable users to navigate through the presented information. For example, an apparatus that generates a main menu of a program guide, which includes program source information and program event information for a plurality of program sources, and further generates navigation menus for allowing a viewer to modify the program guide is disclosed in U.S. Pat. No. 5,694,176, issued Dec. 2, 1997 to Bruette et al. A system and a process in which a program listing is displayed as a grid of two-dimensionally arranged adjacent irregular cells, which vary in length corresponding to time duration of the

programs, with a title of a program being displayed in each of said irregular cells, said grid having a plurality of channels listed in a first dimension and time listed in a second dimension, is disclosed in U.S. Pat. No. 5,809,204, issued Sept. 15, 1998 to Young.

A multi-layered TV GUI that uses a memory for storing graphics data that is capable of storing two graphics planes that represent upper and lower layers of graphics displayable on a TV screen, and that uses a graphics accelerator to combine the graphics planes to produce various graphical effects on the screen is disclosed in U.S. Pat. No. 6,016,144, issued Jan. 18, 2000 to Blonstein et al. (hereinafter "Blonstein '144"). One advantage of a multi-layered TV GUI that produces multiple layers of graphics on a TV screen is that it eliminates the need for a multi-menu hierarchical system. (A hierarchical menu system often causes confusion when the user loses track of the menu that he or she came from and how to get back.) A variety of other TV GUI are disclosed in the following additional issued patents: U.S. Pat. No. 4,706,121, issued Nov. 10, 1987 to Young (hereinafter "Young '121"); U.S. Pat. No. 5,781,246, issued Jul. 14, 1998 to Alten et al.; U.S. Pat. No. 5,986,650, issued Nov. 16, 1999 to Ellis et al.

In Young '121, the multi-layered TV GUI provides a TV GUI that adjusts graphical presentation in a matrix of text to expose a predetermined portion of a lower layer of graphics. In Blonstein '144, electronic program schedule data is stored in a system memory and, during the rendering process, converted into a set of bit-maps (one bitmap for each single layer) and stored in a

graphics accelerator buffer memory. However, while prior art EPGs, such as Young '121 and Blonstein '144 relate generally to graphical displays and in particular to navigation within a 2D graphical display space, they do not approach the advantages of a 3D graphical display.

What is clearly needed is a method and system for cost-effective optimal storing of electronic program schedule data using a combination of on-chip memory and system memory for 3D-enabled EPGs.

SUMMARY OF THE INVENTION

A system that can store electronic program guide information using 3D graphics is disclosed. In a particular embodiment, a data filter and a text-to-image converter are used for converting filtered data into a set of digital images that are defined as a set of texture maps. In order to apply those texture maps, a memory analyzer analyzes the set-top box layout and indicates available memory types. The memory analyzer controls a memory distributor for distributing texture maps into the appropriate types of memory.

In a particular embodiment, the system further comprises a processor coupled to the data filter. The processor executes a first logic in which the total size of the set of texture maps is less than or equal to a memory size. The processor executes a second logic if the total size of the set of texture maps is greater than the memory size, in which case the set of texture maps is divided into at least two groups.

A method according to an embodiment of the invention includes computing a total size of a set of texture maps, comparing the total size of the set of texture maps with a memory size, and then dividing the set of texture maps into at least two groups if the total size of the set of texture maps is larger than the memory size, such that the total size of the texture maps in a first group is the largest possible sum of texture map sizes for which the total size of texture maps in the first group is less than the memory size.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is illustrated by way of example, and not limitation, in the figures.

Figure 1 is a block diagram showing the components of a 3D-enabled electronic device.

Figure 2 is a block diagram showing a mechanism and apparatus for cost-effective memory management in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Accordingly, one advantage of the present invention is in the use of texture map memory for storing electronic program schedule data, thereby saving memory requirements on the system memory for TV set-top boxes.

Figure 1 shows a memory layout in a 3D-enabled personal computer ("PC") or PC-like architecture. Such architectures have a conventional system memory (A memory), special fast access AGP memory (B Memory), which is mapped together with the system memory, texture mapping memory on the 3D graphics chip (C memory), frame buffer memory (D memory), and z-buffer memory (E memory).

In contrast, a conventional set-top box, which does not use a 3D accelerator and 3D graphics pipeline has only A (or A and D) memory (not shown). In existing set-top boxes, including those having a 3D chip, e.g., for games, B, C, and E memory can not be used, because these types of memory can not be reached without using a 3D graphics pipeline and current EPG software does not use such pipeline.

One advantage of the present invention is that providing a system in which a 3D-enabled EPG uses a 3D graphics pipeline and 3D accelerators, all or part of B, C and E memory can be used. Thus, memory usage is optimized to save storage space and increase overall system performance. Another advantage of the present invention is the reduced memory requirements and power consumption result in lower costs to build and operate the system.

Description of the Hardware

In one embodiment of the present invention, the hardware used to practice the invention includes the following:

1. A CPU such as a Celeron or Pentium, e.g., manufactured by Intel Corporation, or any other similar or equivalent CPU.
2. A non-volatile memory, e.g., a ROM, EPROM, EEPROM, EAROM, hard disk, CD ROM, or other memory device.
3. A second main memory device, typically a RAM or magnetic disk, but in some cases other suitable technologies may be used.
4. A graphics accelerator circuit.

Implementing the Memory Optimization

In accordance with a method of the present invention, the following steps are carried out for implementing the memory optimization:

program-schedule data is filtered by a data filter,

the filtered data is converted into a set of digital images by a text-to-image converter,

the set of digital images is defined as a set of texture maps,

set top box layout is analyzed and available memory types/sizes are defined,

based on the memory available and the set of texture maps, a memory distribution algorithm is performed that includes the following steps:

compute the total size of the set of texture maps "St" as the sum of all texture map sizes,

compare St with on-chip C-memory size "Sc"

if St is less than or equal to Sc then the set of texture maps is stored in C memory, or

if St is greater than Sc then the set of texture maps is divided into two groups "G_1" and "G_2" depending on an algorithm that is performed that includes the following steps:

analyze the set of texture maps to determine a group G_1 such that the total size "SG_1" of texture maps in group G_1 is the largest possible sum of texture map sizes for which SG_1 is less than Sc,

compute "SG_2" as $St - SG_1$

group G_1 is stored in C memory,

group G_2 is stored in B memory if available,

if B memory is not available then all texture maps in group G_2 are compressed to fit into C memory.

A data filter, as shown in fig. 2, is the selection process, typically by a user or other parameters, that chooses the relevant scheduling information out of the bulk of scheduling information available. For example, if the user is interested in "news," all news-related objects will be selected (i.e., filtered).

A memory analyzer, as depicted in fig. 2, is the process that analyzes what types and how much of each type of available memory is available in the present system. Typically, it will sample for memory availability and size in a non-destructive manner, as to

ascertain the actual extent of the available memory. In some cases, it may utilize system resources, for example, from the OS, BIOS, Drivers 3Ddirect, etc.

A memory distributor, as shown in fig. 2, is the process (or program) that performs the memory optimization algorithm, as described above.

A texture map compression engine, as shown in fig. 2, is a compression algorithm, such as provided in standard graphics libraries (e.g., *Direct 3D™*, New Riders Publishing, 1997), used to compress the texture maps in accordance with a given software environment.

In the foregoing specification, the invention has been described with reference to specific embodiments thereof. It will, however, be evident that various modifications and changes can be made thereto without departing from the broader spirit and scope of the invention as set forth in the appended claims. The specification and drawings are, accordingly, to be regarded in an illustrative rather than a restrictive sense. Therefore, the scope of the invention should be limited only by the appended claims.

CLAIMS

What is claimed is:

1. A system comprising:

a data filter coupled to a text-to-image converter for converting filtered data into a set of digital images, the set of digital images being defined as a set of texture maps; and

a memory analyzer for analyzing set-top box layout and indicating available memory types, the memory analyzer being coupled to a memory distributor, the memory distributor for distributing texture maps.

2. The system of claim 1, wherein a total size of the set of texture maps is a sum of all texture map sizes.

3. The system of claim 2, further comprising:

a processor coupled to the data filter, the processor executing a first logic in which the total size of the set of texture maps is less than or equal to a memory size; and

a second logic if the total size of the set of texture maps is greater than the memory size, then dividing the set of texture maps into at least two groups.

4. The system of claim 3, wherein a total size of the first group is the largest possible sum of texture map sizes for which the total size of the first group is less than the memory size.

5. The system of claim 3, wherein a total size of the second group is the difference between the total size of the set of texture maps and the total size of the first group.

6. The system of claim 3, wherein the set of texture maps of the first group is stored in a first memory.

7. The system of claim 3, wherein the set of texture maps of the second group is stored in a second memory.

8. The system of claim 3, wherein the set of texture maps of the second group are compressed to fit into the first memory.

9. The system of claim 8, further comprising a compression engine.

10. A method comprising:

computing a total size of a set of texture maps;

comparing the total size of the set of texture maps with a memory size;

dividing the set of texture maps into at least two groups if the total size of the set of texture maps is larger than the memory size, such that the total size of the texture maps in a first group is the largest possible sum of texture map sizes for which the total size of texture maps in the first group is less than the memory size.

11. The method of claim 10 wherein computing a total size of a set of texture maps comprises:

computing a sum of all texture map sizes.

12. The method of claim 10 further comprising:

storing the set of texture maps in a first memory if the total size of the set of texture maps is less than or equal to the first memory size.

13. The method of claim 10 further comprising:

storing a first group of texture maps in a first memory.

14. The method of claim 10 further comprising:

storing a second group of texture maps in a second memory.

15. The method of claim 14 further comprising:

compressing the second group of texture maps to fit into C memory if B memory is not available.

ABSTRACT

A system that can store electronic program guide information using 3D graphics is disclosed. In a particular embodiment, a data filter and a text-to-image converter are used for converting filtered data into a set of digital images that are defined as a set of texture maps. In order to apply those texture maps, a memory analyzer analyzes the set-top box layout and indicates available memory types. The memory analyzer controls a memory distributor for distributing texture maps into the appropriate types of memory.

Diagrams:

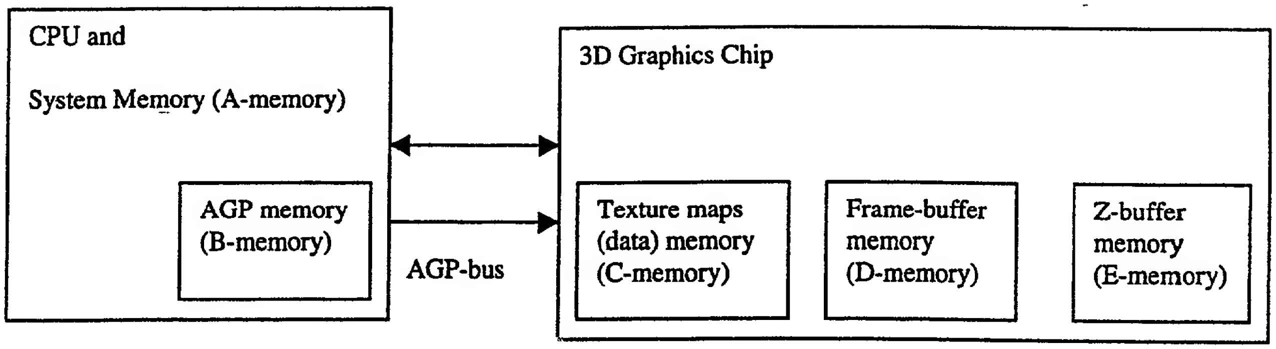

Fig. 1 Memory types and allocation in 3D-enabled electronic devices

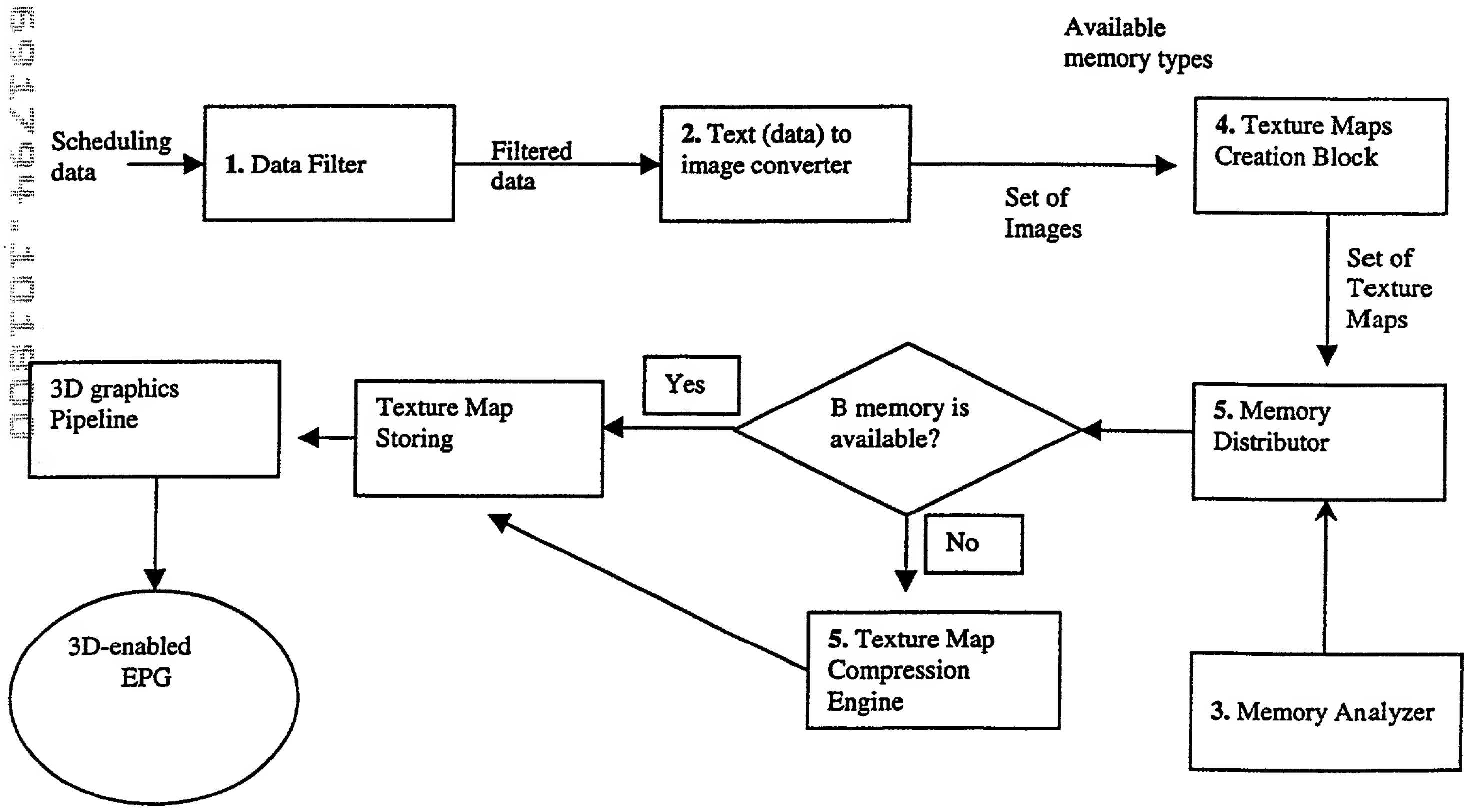

Fig. 2 Mechanism and Apparatus for cost-effective
memory management diagram